

Current Approaches to Treatment the Patients with Widespread Purulent Peritonitis

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Abstract Background. Treatment of disseminated peritonitis is one of the most complex and intractable problems of emergency abdominal surgery. Disseminated purulent peritonitis is a severe variant of complicated intra-abdominal infection and is a life-threatening complication of most acute surgical diseases of abdominal cavity. **Objectives.** To improve the results of surgical treatment of disseminated purulent peritonitis on the basis of a differentiated approach to the choice of treatment depending on the degree of abdominal sepsis. **Materials and methods.** The study is based on the results of treatment of 276 patients with widespread purulent peritonitis admitted to the surgical department of the Samarkand branch of RCEMP in the period from 2015 to 2024. Patients were conditionally divided into two groups: 132 (47.8%) patients were operated on in 2015-2019, who were included in the comparison group, and 144 (52.2%) patients were operated on from 2020 to 2024, who were included in the main group. **Results.** A study of the results of combination therapy using ozonated 0.03% sodium hypochlorite solution for abdominal cavity sanitation and intravenous management in patients with abdominal sepsis showed encouraging results. There was a marked decrease in the rate of postoperative purulent inflammatory complications from 32.4% to 16.7% in SIRS - 0 and SIRS abdominal sepsis ($p < 0.05$), and from 51.5% to 41.4% and from 70.6% to 36.0% in SIRS - 1 and SIRS - 2 abdominal sepsis ($p < 0.05$), respectively. Fatal outcome decreased from 15.1% to 4.9% and from 41.2% to 20.0% in abdominal sepsis SIRS - 1 and SIRS - 2 ($p < 0.05$), respectively. **Conclusions.** Complex application of ozonized sodium hypochlorite solution in the postoperative period contributes to faster recovery of patients, decreased incidence of complications and improved overall clinical results.

Keywords Peritonitis, Ozone, Sodium hypochlorite solution, Treatment

1. Introduction

Treatment of disseminated peritonitis is one of the most complex and intractable problems of emergency abdominal surgery. Disseminated purulent peritonitis (DPP) is a severe variant of complicated intra-abdominal infection and is a life-threatening complication of most acute surgical diseases of abdominal cavity [1,2,3]. Despite all the achievements of clinical medicine, this pathology is accompanied by inexorably high figures of postoperative complications and mortality without a tendency to decrease over the last few decades. Postoperative mortality in widespread peritonitis is 15.1-18%, and when septic shock develops, the mortality reaches 70-80% [4,5,6,7]. In the light of the above, the need to improve the known and develop new effective measures of prevention and treatment of this formidable disease becomes obvious.

Analysis of modern literature shows that there are several directions in the treatment of DPP: traditional surgical interventions, videolaparoscopic interventions. "However, the most accessible direction in everyday practice remains open surgical interventions for widespread purulent peritonitis" [8,9,10,11].

The analysis of the literature shows that at the present time the therapeutic and diagnostic tactics in DPP is one of the urgent and unresolved problems of modern healthcare [12,13,14]. In this regard, there is a necessity to revise the sanitation interventions in DPP depending on the informativeness of non-invasive methods of medical imaging, which allow preoperatively to assess the character of exudate and to detect signs of disease aggression, in this connection, the optimization of diagnostic algorithm to choose the most complete tactics of surgical treatment in each specific case becomes especially urgent.

Despite a lot of ongoing studies and seemingly solved problems, the development of modern methods of treatment of widespread peritonitis and, first of all, the use of laparoscopic surgery, has led to a lot of new unexplored issues, the need to

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solve which confirms the relevance of the present research topic.

2. The Purpose of Study

To improve the results of surgical treatment of disseminated purulent peritonitis on the basis of a differentiated approach to the choice of treatment depending on the degree of abdominal sepsis.

3. Materials and Methods

The study is based on the results of treatment of 276 patients with widespread purulent peritonitis admitted to the surgical department of the Samarkand branch of RCEMP in the period from 2015 to 2024. Patients were conditionally divided into two groups: In 2015-2019, 132 (47.8%) patients who constituted the comparison group were operated on, they underwent traditional methods of treatment, elimination of the source, sanitation of the abdominal cavity with antiseptics and drainage of the abdominal cavity by both open and laparoscopic methods. From 2020 to 2024, 144 (52.2%) patients were under our observation and were included in the main group. Depending on the severity of peritonitis stage, the patients of the main group were conditionally divided into two subgroups. The 1st subgroup consisted of 78 (54.2% out of 144) patients, they used ozonized sodium hypochlorite solution as an antiseptic for the purpose of abdominal cavity lavage. Subgroup 2 consisted of 66 (45.8% out of 144) patients, in this subgroup patients with severe form of abdominal sepsis, who required intravenous injection of ozonated sodium hypochlorite solution in addition to

abdominal cavity lavage with ozonated sodium hypochlorite solution.

Disseminated purulent peritonitis was of different genesis. The most frequent cause of peritonitis in both groups of patients was destructive forms of acute appendicitis (38.8%) and perforated gastric and duodenal ulcer (22.1%). Preoperatively, the severity of the patients' condition was determined according to the APACHE II scale, SOFA and the severity of abdominal sepsis. The indicators of preoperative examination of patients are presented in Tables 1. Both groups were comparable in terms of the severity of the condition and severity of peritonitis.

For detailed characterization of quantitative indicators, the patients in the studied groups were categorized by manifestations of abdominal sepsis according to the degree of systemic inflammatory response syndrome (SIRS):

SIRS- 0 no sepsis;

SIRS - Abdominal sepsis without organ dysfunction;

SIRS-1 - Abdominal sepsis with monorgan dysfunction;

SIRS-2 - Abdominal sepsis with multiorgan dysfunction.

Abdominal sepsis was absent in only 33 (11.9%) patients. Abdominal sepsis without organ dysfunction was found in 127 (46.0%), with monorgan dysfunction - in 74 (26.8%), with multiorgan dysfunction - in 42 (15.2%) patients (Table 2).

Sodium hypochlorite solution was obtained on an electrochemical unit EDO-4) by oxidation of isotonic sodium chloride solution. In order to enhance the effect of the solution and improve microcirculation in the peri-dental tissues, we ozonized the solution. An ozone-oxygen gas mixture was passed through a vial with sodium hypochlorite solution by the barbotage method using a clinical ozonator "UOTA-60-01-Medozon" for 10 min, then the vial was placed in a household refrigerator (6-8°C).

Table 1. Indicators of preoperative examination of patients with widespread purulent peritonitis according to APACHE II and SOFA scales

Groups studied	Indicator	Points			
		no sepsis.	sepsis	severe sepsis	septic shock
	APACHE II	< 10	10-15	16-25	>26
	SOFA	< 8	9-12	13-16	>17
Main group (n=144)		12 (8,3%)	98 (68,0%)	25 (17,4%)	9 (6,2%)
Comparison group (n=132)		21 (15,9%)	88 (66,7%)	19 (14,4%)	4 (3,0%)
Total (n=276)		33 (11,9%)	186 (67,4%)	44 (15,9%)	13 (4,7%)

Table 2. Distribution of patients with disseminated purulent peritonitis by severity of abdominal sepsis

Groups studied	systemic inflammatory response syndrome (SIRS)			
	no sepsis	Abdominal sepsis without organ dysfunction	Abdominal sepsis with monorgan dysfunction	Abdominal sepsis with multiorgan dysfunction
	SIRS-0	SIRS	SIRS-1	SIRS-2
Main group (n=144)	12 (8,3%)	66 (45,8%)	41 (28,5%)	25 (17,4%)
Comparison group (n=132)	21 (15,9%)	61 (46,2%)	33 (25,0%)	17 (12,9%)
Total (n=276)	33 (11,9%)	127 (46,0%)	74 (26,8%)	42 (15,2%)

All patients underwent radial methods of investigation, such as ultrasound and CT. In case of doubt in the diagnosis, 160 patients underwent diagnostic videolaparoscopy. In 140 (87,5%) observations laparoscopy allowed to establish the diagnosis of general diffuse peritonitis and to put indications for conversion and only in 20 (12,5%) cases diagnostic laparoscopy was transformed into therapeutic benefit.

We reviewed the main aspects of surgical treatment of disseminated peritonitis, from preoperative preparation to postoperative management and evaluation of treatment results.

Standard methods of preoperative preparation were applied to the patients in the comparison group. Infusion therapy was performed for hemodynamic stabilization. Crystalloid and colloid solutions were administered to restore circulating blood volume (CBV), prevent and correct hypotension. If necessary, vasopressors were used to maintain blood pressure and organ perfusion. Blood pressure, heart rate, central venous pressure and diuresis were continuously monitored.

Preoperative preparation of patients with widespread peritonitis in the main group was differentiated, i.e. the degree of systemic inflammatory response (SIRS) was taken into account, as the severity of the patient's condition and necessary measures for its stabilization depended on it. The degree of SIRS requires an individualized approach to stabilize the patient's condition and prepare him for surgery. The inclusion of infusion of ozonated sodium hypochlorite solution for patients with abdominal sepsis with mono-organ and multi-organ dysfunction adds an additional dimension to standard management. The main aspects of preoperative preparation for each patient category are summarized below.

Choice of access method, which was determined by the patient's condition and the prevalence of peritonitis. In both the main and comparison groups, laparotomic and laparoscopic accesses were performed in patients with widespread peritonitis depending on the patients' condition. Whenever possible, diagnostic laparoscopy was not missed (Fig. 1) and then it was decided to continue the operation or to proceed to conversion.

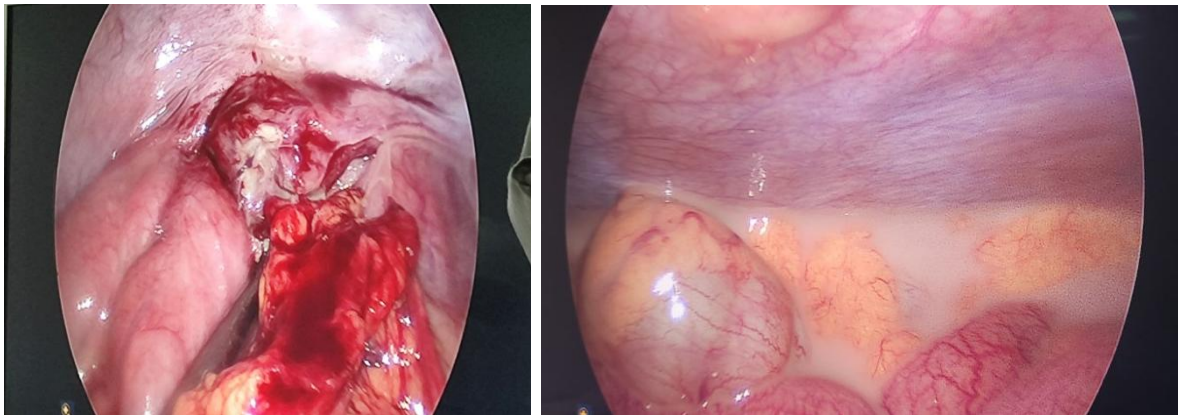


Figure 1. Diagnostic laparoscopy in spilt purulent peritonitis

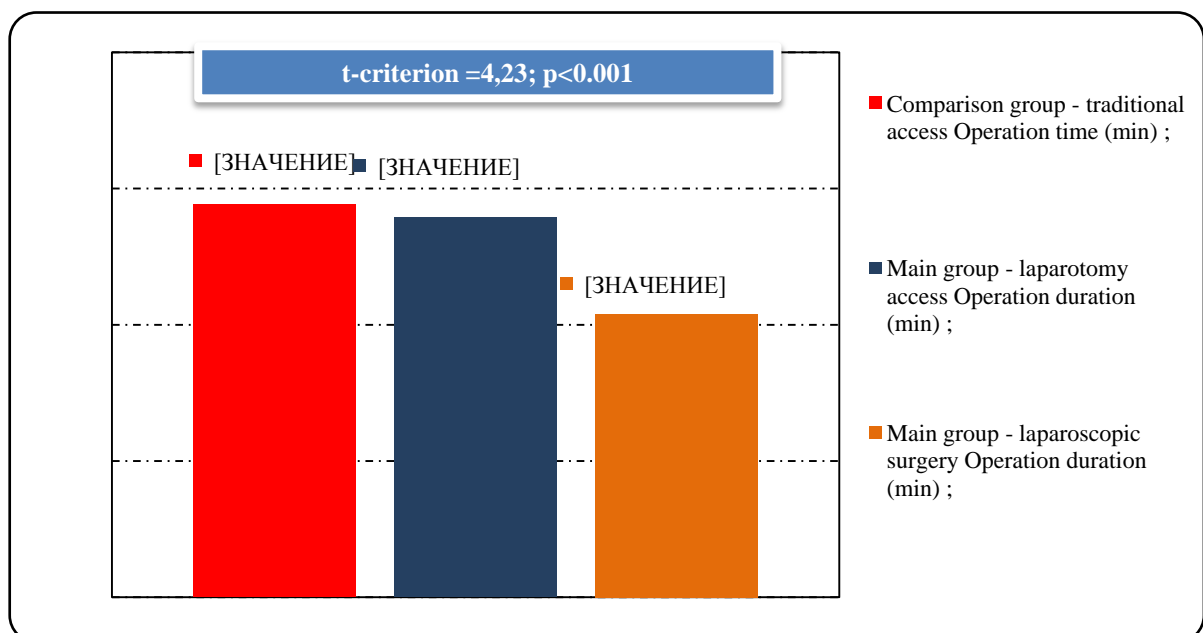


Figure 2. Comparative indices of operation duration (min) depending on the access undertaken

Further elimination of the source of peritonitis was performed, i.e. resection of necrotized tissues, removal of the perforated organ, drainage of abscesses and other purulent foci, nasointestinal intubation of the small intestine. As a rule, identification of the source of peritonitis in these diseases, as well as in intestinal obstruction due to a pinched hernia, twisting or nodular formation does not present significant difficulties. However, revision of abdominal cavity organs in peritonitis on the background of intestinal obstruction has its specific features. After laparotomy, swollen paretic loops of intestine lie in the wound and sometimes fall out of it.

The third stage was sanitation of the abdominal cavity. Patients in the comparison group (2015-2019) were washed with conventional antiseptics, such as decasan, 0.02% furacilin solution, etc. Patients in the main group (2020-2024) had their abdominal cavity sanitized with ozonized sodium hypochlorite solution (0.03%). In this group, a pulsating jet of ozonized sodium hypochlorite solution (0.03%) was used for peritoneal lavage. To create a pulsating jet of liquid, an insufflator of the “Letel doctor” company was used. The aquapurator and the insufflator were connected by an inelastic catheter, the liquid was 0.03% ozonized sodium hypochlorite solution. Using the insufflator of “Letel doctor” company maximum 500 ml of antiseptic was effective for complete sanitation of the abdominal cavity, also the time of the washing stage was reduced. The proposed method

of abdominal cavity sanitation by pulsating jet of 0.03% ozonized sodium hypochlorite solution using “Letel doctor” insufflator allowed to reduce the duration of the operation from 86.5 ± 4.9 to 62.4 ± 2.9 minutes (t -criterion = 4.23; $p < 0.001$) (Fig. 2).

The patients in both groups underwent programmed laparotomy or video-endoscopic sanitation as indicated. 0.03% ozonized sodium hypochlorite solution and conventional antiseptics Decasan, 0.02% furacilin solution were used as antiseptics in the patients of the main and comparison groups, respectively. The patients in the main group underwent programmed video-endoscopic sanitation using the Letel doctor insufflator.

4. Results of the Study

In case of disseminated purulent peritonitis, 5 (3.5%) patients with abdominal sepsis underwent repeated interventions on demand in the main group. In the comparison group, 16 (12.1%) patients with abdominal sepsis underwent repeated interventions on demand (Table 3).

The use of the Letel doctor insufflator for flushing the abdominal cavity through drainage tubes with ozonized sodium hypochlorite solution reduced the number of programmed sanitation interventions from 18.9% to 6.9% (Fig. 3).

Table 3. Surgical interventions performed on patients in the study groups

Operation	Main group (n=144)			
	SIRS-0 (n=12)	SIRS (n=66)	SIRS-1 (n=41)	SIRS-2 (n=25)
On-demand videolaparoscopy (n=1)	-	1	-	-
Programmed videolaparoscopy (n=2)	1	1	-	-
- Conversion (n=1)	-	1	-	-
Relaparotomy on demand (n=4)	-	1	2	1
Programmed relaparotomy (n=8)	-	-	5	3
Operation	Comparison group (n=132)			
	SIRS-0 (n=21)	SIRS (n=61)	SIRS-1 (n=33)	SIRS-2 (n=17)
On-demand videolaparoscopy (n=2)	2	-	-	-
Programmed videolaparoscopy (n=4)	2	2	-	-
- Conversion (n=3)	2	1	-	-
Programmed relaparotomy (n=14)	2	-	6	4
Programmed relaparotomy (n=21)	-	2	11	8

Table 4. Frequency of symptoms of intestinal motor evacuation dysfunction

Signs of bowel dysfunction	Comparison group (n=132)		Main group (n=144)		p
	abs.	%	abs.	%	
Wound festering	25	18,9	21	14,6	> 0,05
Pneumonia	14	10,6	10	6,9	> 0,05
Abdominal abscess	2	1,5	-	-	-
Eventuation	2	1,5	-	-	-
Pleural empyema	2	1,5	-	-	-
Pleuritis	-	-	3	2,1	-
Thrombophlebitis	-	-	3	2,1	-
Lethality	12	9,1	7	4,9	> 0,05

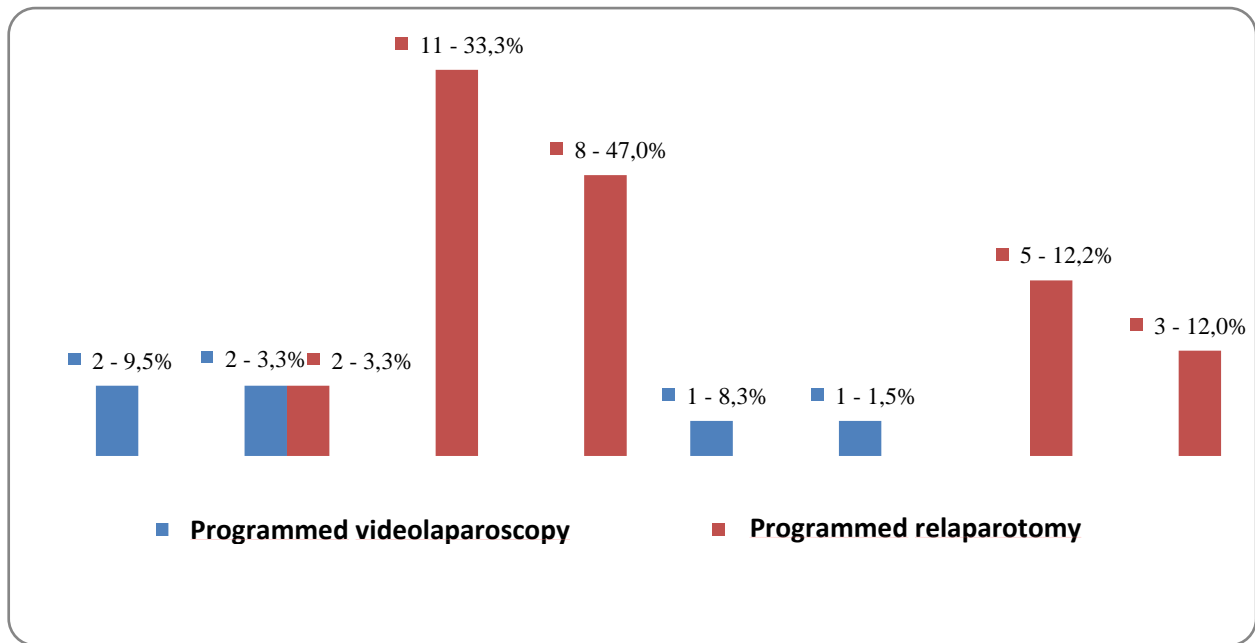


Figure 3. Number of programmed sanitary surgical interventions

The frequency of postoperative complications and mortality in patients with widespread purulent peritonitis is presented in Table 4. We observed such complications as wound suppuration in 16.7% of cases, pneumonia was observed in 8.7% of cases, abdominal cavity abscess was observed in 0.7% of cases, eventure - 0.7%, pleural empyema - 0.7%, pleurisy - 1.1% and thrombophlebitis in 1.15 cases.

In the comparison group 41 (31.1%) patients developed 45 complications, and in the main group 32 (22.2%) patients registered 37 complications. Consequently, the number of complications in the main group was reduced by 8.9%. Postoperative mortality in the main group was 4.2% lower than in the comparison group.

In general, complex application of ozonized sodium hypochlorite solution in the postoperative period contributes to faster recovery of patients, reduction of complications and improvement of overall clinical results.

5. Funding

A study of the results of combination therapy using ozonated 0.03% sodium hypochlorite solution for abdominal cavity sanitation and intravenous management in patients with abdominal sepsis showed encouraging results. There was a marked reduction in the rate of postoperative purulent inflammatory complications from 32.4% to 16.7% in SIRS - 0 and SIRS abdominal sepsis ($p < 0.05$), and from 51.5% to 41.4% and from 70.6% to 36.0% in SIRS - 1 and SIRS - 2 abdominal sepsis ($p < 0.05$), respectively. In addition, there was a reduction in the mean duration of hospitalization from 12.9 days to 10.1 days for abdominal sepsis SIRS - 0 and SIRS ($p < 0.05$) and from 21.1 days to 16.6 days for abdominal sepsis SIRS - 1 and SIRS - 2 ($p < 0.05$). Lethality decreased from 15.1% to 4.9% and from 41.2% to 20.0% in abdominal

sepsis SIRS - 1 and SIRS - 2 ($p < 0.05$), respectively.

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Conflicts of interest. The authors have no conflicts of interest.

REFERENCES

- [1] Davlatov S. S., Kasimov S. Z. Extracorporeal technologies in the treatment of cholemic intoxication in patients with suppurative cholangitis // The First European Conference on Biology and Medical Sciences. – 2014. – C. 175-179.
- [2] Temirovich A. M. et al. Prevention and treatment of intraabdominal hypertension in patients with peritonitis // Bulletin of Science and Education. – 2021. – №. 3-2 (106). – C. 75-79.
- [3] Andriushchenko V. P. Acute purulent widespread peritonitis: conceptual aspects of modern surgical tactics // Infusion & Chemotherapy. – 2020. – №. 3.2. – C. 7-9.
- [4] Grubnik V. V. et al. Successful treatment of severe purulent peritonitis with intraabdominal hypertension complications (clinical case) // Kharkiv Surgical School. – 2021. – №. 5-6. – C. 62-65.
- [5] Zavyalkin V. A., Barskaya M. A., Yukhimets S. N. Results of treatment of diffuse purulent peritonitis in children // Russian Journal of Pediatric Surgery. – 2024. – T. 28. – №. 1. – C. 15-25.
- [6] Angenete E. et al. Laparoscopic lavage is feasible and safe for the treatment of perforated diverticulitis with purulent peritonitis: the first results from the randomized controlled trial dilala // Annals of surgery. – 2016. – T. 263. – №. 1. – C. 117-122.

- [7] Mammadova E. T. Levels of cytokines in extended purulent peritonitis and methods of immunocorrection // The Ukrainian Journal of Clinical Surgery. – 2020. – T. 87. – №. 11-12. – C. 54-61.
- [8] Davlatov S. S., Kasymov Sh. Z., Kurbanliyazov Z. B., Rakhmanov K. E., Ismailov A. O. Plasmapheresis in the treatment of cholemic endotoxiosis // «Academic Journal of Western Siberia». - 2013. - № 1. - P. 30-31.
- [9] Garaev M. R. et al. Endovascular Therapy in the Combination Treatment of Widespread Purulent Peritonitis // Surgery and. – 2024. – T. 14. – №. 1. – C. 37.
- [10] Murav'ev K. A. et al. Clinical and morphological features of widespread purulent peritonitis current during long programmed sanitization of the abdominal cavity // Journal of Experimental and Clinical Surgery. – 2012. – T. 5. – №. 1. – C. 47-50.
- [11] Kasymov S. Z., Davlatov S. S. Hemoperfusion as a method of homeostasis protection in multiple organ failure syndrome // Academic Journal of Western Siberia. – 2013. – T. 9. – №. 1. – C. 31-32.
- [12] Yangiyev B. A. et al. Outcomes of operative intervention for recent major biliary tract injuries // Journal the Coryphaeus of Science. – 2024. – T. 6. – №. 1. – C. 80-87.
- [13] Rakhmanov K. E. et al. The treatment of patients with major bile duct injuries // Academic Journal of Western Siberia. – 2013. – T. 9. – №. 1. – C. 33-34.
- [14] Ruziboev S. A. et al. Results Of Treatment Of Acute Diffuse Purulent Peritonitis Using Laparostomy // The American Journal of Medical Sciences and Pharmaceutical Research. – 2020. – T. 2. – №. 11. – C. 66-71.